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NEW ENGLAND DIV APR 80

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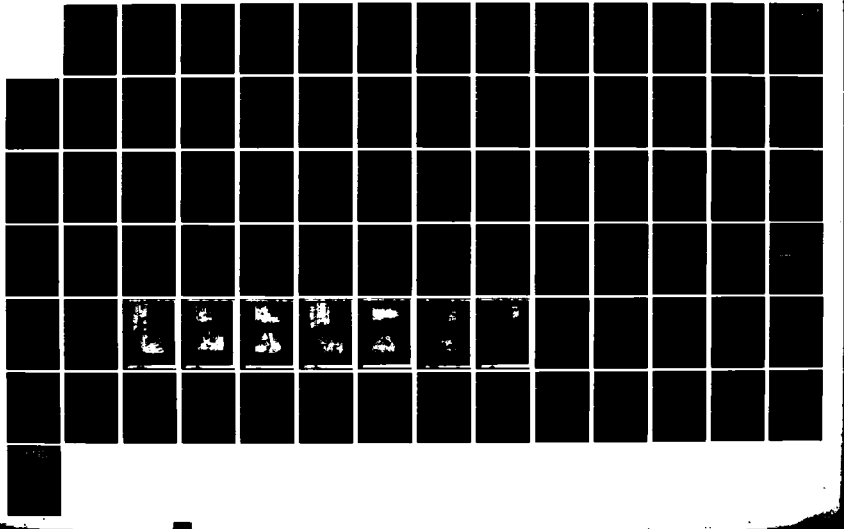
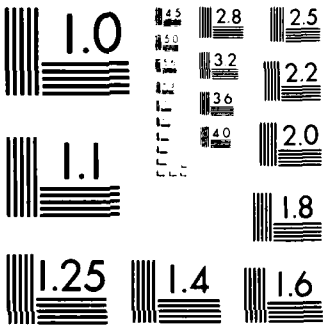




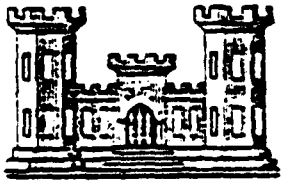
FINAL

MASSACHUSETTS COASTAL AREA

MEDFORD, MASSACHUSETTS

WRIGHTS POND DAM
MA 00454

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASS. 02154

APRIL 1980

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19 KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Massachusetts Coastal Area
Medford, Massachusetts
Mystic River Tributaries to Mystic River

20 ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam is a 400 ft. long, 25 ft. hydraulic height earth fill embankment structure, with a small concrete outlet structure near the right abutment. Visual inspection indicated the dam to be in generally fair condition. Erosion was observed growing on both the upstream and downstream slopes. The dam has a small size classification and a high hazard potential classification. The owner should institute various remedial measures.

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REFERENCE OR OFFICE SYMBOL	SUBJECT
NEDED-E	Dam Safety Draft Report

TO: Chief, Design Branch
Chief, Geotechnical Engrg. Branch
Chief, Water Control Br.

FROM: Chairman,
Dam Safety Review Board

DATE: 3 April 1980

CMT 1

Attached for your review are two copies of the Architect-Engineer's draft report for Wrights Pond Dam Dam, Identity No. MA 454. The review board meeting date for this report is 14 April. Please present your comments in writing under the format shown below. Please return one copy with your comments. Cost code for this rewiew is ABA0 2.0702.000000 (FY80)

Incl (dupe)
as

D. Buono
DIBUONO

NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS
DRAFT REPORT REVIEW COMMENTS
_____ DAM, IDENTITY NO. _____

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NOTE: Bring nine (9) copies of comments to review board meeting.

NATIONAL DAM INSPECTION PROGRAM
PHASE I INVESTIGATION REPORT
BRIEF ASSESSMENT

Identification No.: MA 00454

Name of Dam: Wrights Pond Dam

Town: Medford

County and State: Middlesex County, Massachusetts

Stream: Offstream Tributary to Mystic River

Date of Inspection: November 1, 1979

The dam is a 400 foot long, 25 foot hydraulic height earth fill embankment structure, with a small concrete outlet structure near the right abutment. The dam is owned and operated by the City of Medford. It is believed that the dam was constructed about 1890.

There were no indepth engineering data available for review. The condition of the dam was primarily evaluated by visual inspection, past performance history and sound engineering judgement. Visual inspection indicated the dam to be in generally fair condition. Erosion was observed on the upstream slope and trees were observed growing on both the upstream and downstream slopes.

The dam has a small size classification and a high hazard potential classification. Based upon Corps Guidelines, the test flood would be in the 1/2 PMF to PMF range. The PMF was used for the test flood due to the urban residential development within the dam failure impact area. The test flood inflow from the 0.41 s.m. drainage area is 1,230 cfs.

The routed test flood outflow from the pond is 910 and 830 cfs, with 1 foot of stoplogs and without stoplogs in the outlet structure, respectively. The outlet structure will be discharging 30 cfs and 50 cfs or 3.3 and 6 percent of the test flood outflow for the conditions stated above. The dam would be overtopped by about 1.4 and 1.3 feet by the test flood outflow with and without 1 foot of stoplogs in the outlet structure, respectively.

It is recommended that the Owner engage a qualified registered professional engineer to perform the following: detailed hydraulic/hydrologic investigation to determine overtopping potential and need for increasing spillway capacity; provide a drawdown facility; design riprap slope protection for the upstream slope of the dam; determine procedures for removal of trees growing on the dam embankment and within 10 feet of the downstream toe and to assist in the selection of suitable fill materials for backfilling of the voids left in the embankment after removal of the tree root systems; a seismic stability investigation of the dam.

The Owner should institute remedial measures which include: brush should be cleared from the slopes of the dam embankment and from the area within 10 feet of the downstream toe; minor erosion on the crest should be repaired and grassy vegetation should be established on the crest to protect the soil against erosion; the outlet culvert should be cleared of debris and the spalled concrete repaired; establish a formal operational procedure and maintenance program for the dam; operating the existing outlet structure without stoplogs to provide maximum available discharge

and storage capacity; clean out and maintain the downstream outlet channel; develop a formal warning system for warning the downstream dam failure impact area in case of emergency; provide around the clock monitoring of the dam during periods of heavy rainfall; institute a program of annual technical inspection.

The recommendations and remedial measures should be implemented by the Owner within one year after receipt of this Phase I Investigation Report.

Ronald H. Cheney

Ronald H. Cheney, P.E.
Vice President

Hayden, Harding & Buchanan, Inc.
Boston, Massachusetts

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to

assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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APPENDIXES

Stones and debris are partially blocking the downstream culvert (photograph 6). Also wood is being stored along the outlet channel which could tumble into and block the channel.

e. Downstream Channel

The spillway outlet channel is shown in photograph 7. The channel is not well defined. A few large boulders are lying in the channel floor near the dam. Further downstream, the channel enters a 30 inch metal culvert, photograph 6, and flows into an urban storm drain system. Stones and debris were observed in the channel upstream of the culvert intake. Wood is apparently being stored to the immediate right of the channel. A debris screen located in front of the culvert is in generally good condition.

3.2 Evaluation

Based on the visual inspection, the dam appears to be in generally fair condition.

Continued erosion of the upstream slope could eventually lead to overtopping of the embankment, if left unchecked.

The trees growing on the embankment slopes and at the downstream toe endanger the stability of the dam. Uprooting of these trees by high winds and rotting of the root systems of trees that have died could provide pathways for seepage and lead to internal erosion of the embankment (piping).

The lack of vegetation on the crest renders it less resistant to erosion by runoff from rainfall or due to overtopping if it should occur. Such erosion could result in failure of the dam.

The spillway concrete and stoplogs appear to be in good condition. The concrete lining of the masonry outlet culvert is spalled and partially blocked with debris.

Downstream Slope

The downstream slope of the dam is inclined at 2H:1V and is covered with extensive tree growth, as shown in photograph 3. A number of trees are quite large and have extensive root systems growing into the embankment. The largest of these trees (6 foot diameter base) is shown in photograph 4. This tree and several others on the slope appear to be dead. The downstream slope appears uneven in some areas, probably due to minor erosion. A relatively large erosion gully was observed on the downstream slope near the crest in the central portion of the dam, visible in photographs 2 and 4. No seepage was observed on the downstream side of the dam.

c. Appurtenant Structures

A concrete spillway is located at the right abutment of the dam, as shown in photographs 5 and 10. The spillway appears to be founded on bedrock which outcrops at the right abutment, as can be seen in photograph 5. Most of the spillway outlet channel is in bedrock, as shown in photograph 12. Spalling of the concrete outlet channel can be seen in photograph 11. Debris within the concrete outlet channel was also observed.

No regulating outlets for the reservoir are known. A cast iron object which may be a control valve stem for an old pipe outlet was observed on the upstream slope near the center of the dam, but its use is unknown.

d. Reservoir Area

There are no indications of instability along the banks of the reservoir in the vicinity of the dam.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General

A small flow was discharging from the outlet structure at the time of inspection. Approximately one foot of stoplogs were in place.

b. Dam

The dam is an earth embankment about 25 feet high, 400 feet long, and 12 feet wide at the crest. A concrete spillway is located at the right abutment. No controlled outlets for the reservoir are known. There is a bedrock outcrop at the right abutment of the dam.

Upstream Slope

The upstream slope of the dam is covered with brush, numerous small trees and several dead tree stumps, as shown in photograph 1. There is no riprap protection on the upstream slope, and erosion scarps extending 1-2 feet above the reservoir level have formed along much of the slope, as shown in photograph 1. Erosion gullies up to 4-5 feet wide and 2 feet deep were observed at several locations along the slope.

Crest

The crest of the dam is bare soil with no protective vegetation, as shown in photograph 2. The surface of the crest appears uneven, probably due to minor erosion. No evidence of cracking or misalignment of the crest was observed.

SECTION 2

ENGINEERING DATA

2.1 Design Data

No information was located indicating when or by whom the dam was designed. No indepth design calculations were located.

2.2 Construction Data

No construction data was located for this dam.

2.3 Operation Data

No operational manual exists for this dam.

2.4 Evaluation of Data

a. Availability

No engineering data was located regarding Wrights Pond Dam. A State Inspection Report for 1974 was made available at the State Department of Environmental Quality Engineering, Division of Waterways, Boston Office.

b. Adequacy

No indepth engineering data was made available. This, therefore, does not permit a structural and hydraulic assessment of the dam from the standpoint of review of design calculations but must be based primarily on the visual inspection, past performance history, and sound engineering judgement.

c. Validity

The field investigation indicates that the external features of the intake structure substantially agree with those shown on the 1974 State Inspection Report sketch. The major discrepancies found were the 5± foot maximum height and the 150 foot length of the dam indicated within the State Inspection Report.

(4) Gates ---------- None

(5) U/S Channel ---------- None

(6) D/S Channel ---------- stone masonry 6' x 2.8' box culvert, discharges to unlined stream channel

j. Regulating Outlets

There are no known regulating outlets at Wrights Pond Dam.

e. Storage (acre-feet)

(1) Normal pool ---------- 245

(2) Flood control pool ---------- N/A

(3) Spillway crest pool ---------- 245±

(4) Top of dam ---------- 334±

(5) Test flood pool ---------- 381±

f. Reservoir Surface (acres)

(1) Normal pool ---------- 24

(2) Flood control pool ---------- N/A

(3) Spillway crest ---------- 24

(4) Test flood pool ---------- 37

(5) Top of dam ---------- 35

g. Dam

(1) Type ---------- gravity earth embankment

(2) Length ---------- 400'±

(3) Height ---------- 25'±

(4) Top Width ---------- 12'

(5) Side Slopes ---------- u.s. 3:1; d.s. 2:1

(6) Zoning ---------- Unknown

(7) Impervious Core ---------- Unknown

(8) Cutoff ---------- Unknown

(9) Grout curtain ---------- Unknown

h. Diversion and Regulating Tunnel ---------- None

i. Spillway

(1) Type ---------- concrete, overflow

(2) Length of weir ---------- 2.5'

(3) Crest elevation -------- 136.7 NGVD without stoplogs
137.7 with 1' of stoplogs

4. Ungated Spillway Capacity at Test Flood

The PMF test flood inflow is 1,230 cfs. The spillway discharge with and without 1 foot of stoplogs would be approximately 50 cfs and 30 cfs, respectively. These capacities corespond to 3± and 6± percent of the routed test flood outflow.

5. Total Project Discharge at Test Flood Elevation

Under test flood conditions, the total project discharge would be about 830 cfs without stoplogs in the spillway. The total project discharge with 1 foot of stoplogs in place would be approximately 910 cfs. The test flood elevations are 141.3 and 141.4, respectively.

c. Elevation (ft. above NGVD - approximate only)

(1) Streambed at toe of dam ---------- 115±

(2) Bottom of cutoff ---------- Unknown

(3) Maximum tailwater ----------Unknown

(4) Normal pool ---------- 137

(5) Full flood control pool ---------- N/A

(6) Spillway crest ---------- 136.7 without stoplogs
137.7 with 1' stoplogs

(7) Design surcharge (Original Design) --------- Unknown

(8) Top of Dam ---------- 140±

(9) Test flood surcharge ------- 141.3± without stoplogs
141.4± with 1' stoplogs

d. Reservoir (Length in feet)

(1) Normal pool ---------- 1800±

(2) Flood control pool ---------- N/A

(3) Spillway crest pool ---------- 1800±

(4) Top of dam ---------- 1900±

(5) Test flood pool ---------- 1950±

b. Discharge at Outlet

1. Outlet Works

The outlet works for this project consist of a concrete spillway which discharges into a concrete lined stone masonry box culvert. The spillway has a 1.2 foot high weir with a 2.5 foot long by 4.7 foot high discharge opening. There are provisions for placing stoplogs on top of the weir to control the outflow from the structure. The crest of the weir is at elevation 136.7, approximately 3.3 feet below the top of the dam, elevation 140. The box culvert, beyond the weir, has dimensions of 6 feet long by 2.8 feet high and discharges into a natural stream channel. Several hundred feet downstream, this stream flows into a 30 inch corrugated metal culvert which is partially blocked by stones. The culvert is connected to a storm drainage system.

2. Maximum Known Flood

No records of maximum impoundment or discharges are available for this project. Information obtained from U.S. Weather Bureau records indicate that about 14 inches of rainfall occurred in the general vicinity of the dam between August 17 and 20, 1955. Data from the same source shows that approximately 5 inches of rainfall occurred in this area during the period of September 17 to 22, 1938. According to the caretaker, the dam was overtopped in approximately 1957.

3. Ungated Spillway Capacity at Top of Dam

The maximum capacity of the outlet structure, without stoplogs, is 50 cfs with the water level at the top of dam, elevation 140. The maximum spillway capacity with 1 foot of stoplogs in place would be 30 cfs for this condition.

g. Purpose of Dam

The purpose of this dam is for recreation. The spillway weir and stoplogs are used to control the water level in Wrights Pond.

h. Design and Construction History

There were no records available to indicate when the dam was built or when subsequent repairs or modifications were made. According to City of Medford Highway Department personnel, the existing concrete spillway was constructed approximately 20 years ago to replace a wooden structure.

i. Normal Operational Procedures

The spillway is the only known operational facility for the dam. According to City of Medford Highway Department personnel, in the summer approximately 2 feet of stoplogs are placed at the spillway inlet to raise the level of the pond for recreational purposes. In the winter the stoplogs are lowered to one foot.

1.3 Pertinent Data

a. Drainage Area

The drainage area, 0.41 s.m. (264 acres) is generally hilly, undeveloped land. Wrights Pond is fed by several small streams. The pond has a beach area and is used for recreation.

Located to the south and southeast of the pond is a heavily developed residential area. State Route 28 and Interstate Route 93 are located several hundred feet to the west of Wrights Pond. The areas to the north and northeast are undeveloped and known as Wrights Park.

There are no other known operational facilities contained at this dam. Water discharged through the spillway flows into a 30 inch corrugated metal pipe culvert, located several hundred feet downstream of the dam, which flows into an urban storm drain system (photograph 6).

c. Size Classification

Based upon Corps Guidelines, the size classification of small requires a storage capacity ranging between 50 to 1000 acre-feet and a hydraulic height ranging between 25 to 40 feet. This dam is classified as small based on its storage capacity of 406± acre-feet and height of 25± feet.

d. Hazard Classification

The dam has a high hazard potential due to the potential for the loss of more than a few lives from dam failure flooding. It is estimated that approximately 25 houses would receive excessive, up to 10 feet deep, flood water damage if the dam were to fail. The flood stage could reach depths of 10 feet. The maximum failure discharge, based upon Corps Guidelines, would be 14,700 cfs.

e. Ownership

The dam is owned by the City of Medford, Massachusetts.

f. Operator

The dam is maintained by the City of Medford Highway Department, Mr. Frank Lawsky is the designated caretaker. The address is 85 Salem Street, Medford, Massachusetts 02155; telephone 617-396-5500. The swimming and beach area located at the left abutment area is maintained by the City of Medford Parks Department.

1.2 Description of Project

a. Location

Wrights Pond Dam is located in the City of Medford in Middlesex County, Massachusetts. The dam impounds the waters of Wrights Pond and is located at the southern end of the pond. Wrights Pond Dam is shown on the U.S.G.S. Boston North, Massachuestts Quadrangle Sheet with the approximate coordinates of North 42°26'25", West 71°06'24".

b. Description of Dam and Appurtenances

Wrights Pond Dam is a 25± foot high by 400± foot long earth embankment structure with a concrete and stone masonry outlet culvert which acts as a spillway. The embankment runs from the northeast to southwest for about 300 feet and then turns sharply to the north for another 100 feet. See drawings in Appendix B and photographs in Appendix C. The crest and downstream face of the dam are generally covered with vegetation including a number of large trees (photograph 9). The dam has a slope on the upstream face of approximately 3H:1V and a slope of approximately 2H:1V on the downstream face. The dam crest is about 12 feet wide.

The concrete spillway has a 2.5 foot long by 4.7 foot high opening, although the weir crest is only 3.3 feet below the top of the dam. There are provisions for placing stoplogs on top of this weir. The spillway discharges into a concrete lined stone masonry box culvert 6 feet long by 2.8 feet high (photograph 12). The culvert discharges into a small unlined channel (photograph 7).

PHASE I
NATIONAL DAM INSPECTION PROGRAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority

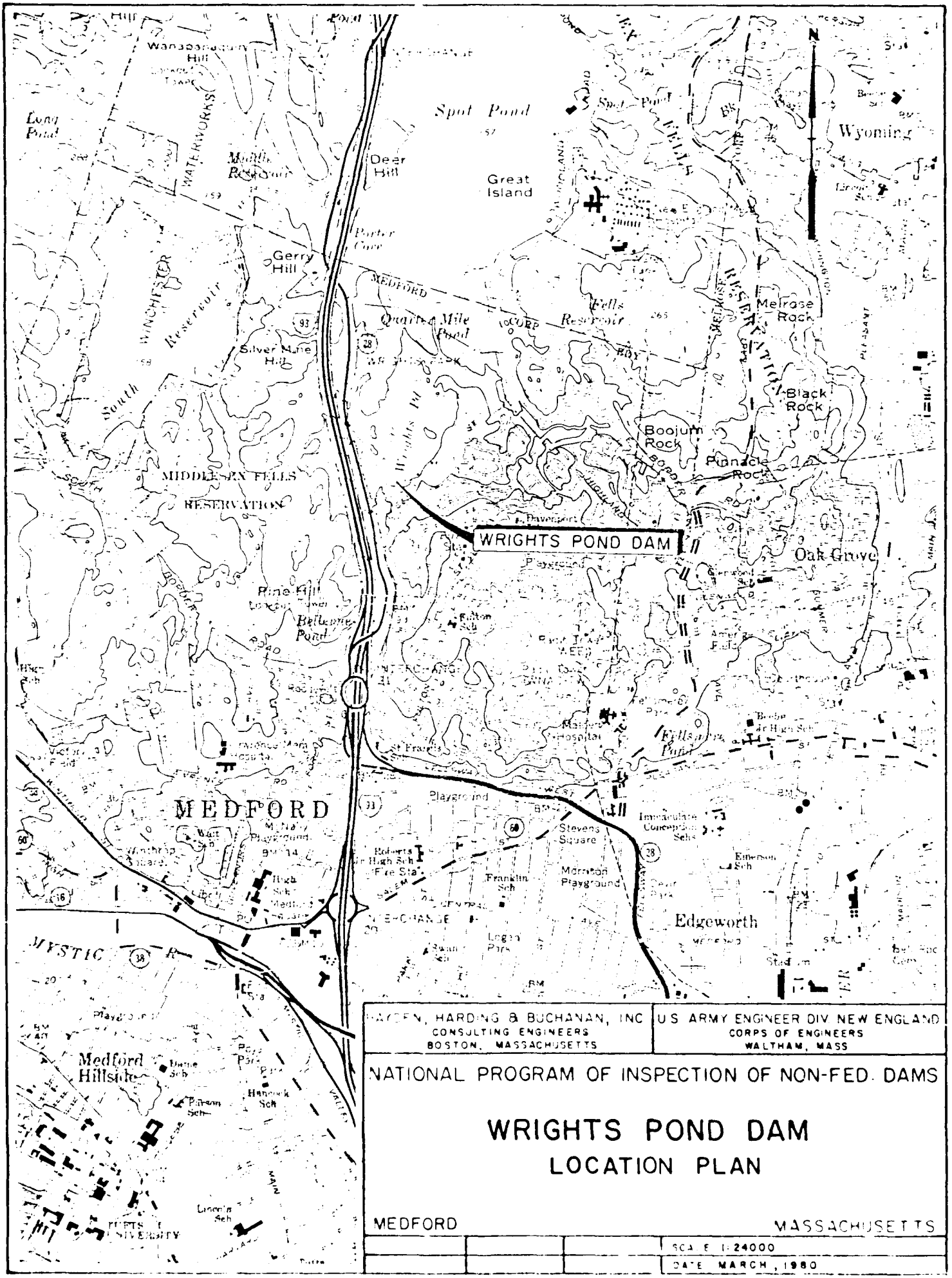
Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Hayden, Harding & Buchanan, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued Hayden, Harding & Buchanan, Inc. under a letter of 24 October 1979 from William E. Hodgson Jr., Colonel, Corps of Engineers. Contract No. DACW 33-80-C-0006 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.



GAYDEN, HARDING & BUCHANAN, INC
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

U.S. ARMY ENGINEER DIV NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WRIGHTS POND DAM
LOCATION PLAN

MEDFORD MASSACHUSETTS

SCALE 1:24000

DATE MARCH, 1980

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General

The purpose of the dam is for recreation. The spillway's manually placed stoplogs are used to control the water surface elevation. In the summer approximately 2 feet of stoplogs are placed at the spillway. In the winter these stoplogs are lowered to one foot.

b. Description

There are no warning systems in effect at this dam.

4.2 Maintenance Procedures

a. General

There are no formal maintenance procedures for the dam. The dam is maintained by the City of Medford Highway Department. The bathing area located at the left abutment area is maintained by the City of Medford, Parks Department.

b. Operating Facilities

Stoplogs are placed at the spillway to control the level of the pond. The Highway Department is responsible for maintenance of the spillway.

4.3 Evaluation

There are no formal written operational or maintenance procedures. The owner should institute a program of annual technical inspection.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Wrights Pond is located in the City of Medford, Massachusetts near the Medford-Stoneham-Malden corporate boundaries. The drainage area, 0.41 square miles (264 acres) is made up of hilly, undeveloped land. The pond, which has a surface area of about 35 acres, discharges through a spillway located near the southern portion (right abutment) of the dam.

The area to the south of the pond and along the natural drainage path of its outlet brook has moderate to high density urban residential development. Spot Pond, a large MDC water supply reservoir is located directly to the north. See the drainage area map and drawings in Appendixes B and D.

5.2 Design Data

Hydraulic/hydrologic design data for this project could not be located.

5.3 Experience Data

Records of past flood events and possible overtopping of the dam could not be found. According to City of Medford personnel the dam was overtopped in about 1957.

Information obtained from the records of the U.S. Weather Bureau indicate that about 14 inches of rainfall occurred within the general vicinity of Wrights Pond from August 17 to 20, 1955, and about 5 inches occurred from September 17 to 22, 1938.

5.4 Test Flood Analysis

This dam has a small size classification and a high hazard potential. Based upon Corps Guidelines, the test flood would range between 1/2 PMF to PMF. Due to the extensive residential development within the dam failure impact area, the test flood choosen was the PMF. Runoff from the small 0.41 square mile drainage area is beyond the 2 square mile lower limit of the Corps Guidelines chart. For these small drainage areas, test flood runoff rates are based upon 3000 cfs/sm.

Assuming no stoplogs, and the initial pool elevation to be at the spillway elevation, 136.7, the inflow of 1,230 cfs would surcharge the pond to elevation 141.3. This surcharge would overtop the dam by 1.3 feet and result in a routed outflow of 830 cfs. With 1 foot of stoplogs and a pool elevation of 137.7, the pond would be surcharged to elevation 141.4. The routed outflow for this condition would be 910 cfs. The pond would provide stage storage for 5 to 6.2 inches of runoff during test flood conditions. The spillway would pass 30 cfs and 50 cfs, with and without one foot of stoplogs. These discharges correspond to 3.3 and 6 percent of the routed test flood outflows.

During summer operation, with the stoplogs set at a higher level, the spillway discharge capacity would be reduced. The test flood inflow of 1,230 cfs would cause the surcharge elevation and dam overtopping to increase. Routed test flood outflow would also increase.

5.5 Dam Failure Analysis

The failure analysis was performed assuming a pond level at elevation 140, top of dam. The dam has a hydraulic height of 25

feet and a maximum storage capacity of 334 acre-feet. Forty percent of a 175 foot long section of the dam (measured at midheight) at the location of the "original outlet channel" area, was assumed to have failed. Immediately before the failure of the dam, the spillway, with 1 foot of stoplogs in place, would be discharging 30 cfs. This initial flow would not result in any damages to structures or noticeable flooding in downstream areas.

Based on Corps "rule of thumb" guidance, the failure of the dam would result in a peak outflow of 14,700 cfs. Immediately downstream of the dam there is a moderate to heavily developed residential area that would be inundated by the failure discharge. At least 25 homes within this impact area could suffer flood damage. The typical maximum failure flood stage within the dam failure impact area is 10 feet deep. Flood water depths which could cause damage could vary from 2 to 10 feet, depending on the locations and elevations of structures within the impact area. Loss of more than a few lives and excessive property damages could occur as a result of the failure of this dam, thereby providing for a high hazard classification.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The visual inspection indicates the following potential structural problems.

a. Erosion of the upstream slope which could lead to overtopping.

b. The presence of large trees on the downstream slope which could cause seepage or erosion problems if a tree blows over and pulls out its roots or if a tree dies and its roots rot.

c. Lack of vegetation on the crest which makes it more susceptible to erosion during rainstorms or overtopping.

6.2 Design and Construction Data

No original design and construction data are available for the dam.

6.3 Post-Construction Data

The existing concrete spillway facility was constructed about 1960. No additional information was available about post-construction changes.

6.4 Seismic Stability

The dam is located in Seismic Zone 3. Considering its height, a seismic stability investigation should be conducted as recommended in Section 7.2.

SECTION 7

ASSESSMENT, RECOMMENDATION & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

Based on a visual inspection, the dam is judged to be in generally fair condition.

b. Adequacy

The information made available, along with the visual inspection, is adequate for a Phase I level of investigation.

c. Urgency

The recommendations and remedial measures presented below should be implemented by the Owner within one year after receipt of this Phase I Inspection Report.

7.2 Recommendations

The Owner should engage a qualified registered professional engineer to:

a. Design riprap slope protection for the upstream slope of the dam.

b. Determine procedures for removal of trees growing on the dam embankment and within 10 feet of the downstream toe and to assist in the selection of suitable fill materials for back-filling of the voids left in the embankment after removal of the tree root systems.

c. Perform a seismic stability investigation of the dam.

d. Perform a detailed hydraulic/hydrologic investigation to determine overtopping potential and the need to increase spillway capacity and discharge channel size.

e. Provide a drawdown facility which could be used to lower the level of the reservoir in the event of an emergency.

7.3 Remedial Measures

a. Operation and Maintenance Procedures

1. Brush should be cleared from the slopes of the dam embankment and from the area within 10 feet of the downstream toe.

2. Minor erosion on the crest should be repaired and grassy vegetation should be established on the crest to protect the soil against erosion.

3. The outlet culvert should be cleared of debris and the spalled concrete repaired.

4. Stones and debris within the downstream channel in front of the 30-inch culvert should be cleared. Wood, which could tumble into and block the outlet channel, should not be stored along the channel banks.

5. The Owner should establish a formal operational procedure and maintenance program for the dam.

6. Until item 7.2.d. is implemented the stoplogs should be removed from the spillway to provide maximum discharge and storage capacity.

7. The Owner should establish a formal downstream warning system in case of an emergency and provide around the clock monitoring of the dam during periods of heavy rainfall.

8. The owner should institute a program of annual technical inspection.

7.4 Alternatives

There are no practical alternatives to the recommendations.

APPENDIX A

INSPECTION CHECKLIST

VIS AL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT WRIGHTS POND DAM

DATE Nov. 1, 1979

TIME 9 am

WEATHER Cool (~45°), Sunny

W.S. ELEV. 136.7± U.S. ___ DN.S.

PARTY:

1. R. Cheney, HHB
2. D. Vine, HHB
3. D. LaGatta, GEI
4. D. Shields, GEI
5. ___
6. ___
7. ___
8. ___
9. ___
10. ___

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Embankment Dam	D. LaGatta, D. Shields	
2.	Spillway-Outlet Channel	R. Chenev, D. Vine	
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT WRIGHTS POND DAM — DATE Nov. 1, 1979

PROJECT FEATURE Embankment Dam — NAME D. LaGatta

DISCIPLINE Geotechnical Engineer — NAME D. Shields

Structural Engineer — R. Cheney, D. Vine

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	140.0 ±
Current Pool Elevation	136.7 ±
Maximum Impoundment to Date	unknown
Surface Cracks	None observed.
Pavement Condition	No pavement, bare soil.
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	No misalignment observed.
Horizontal Alignment	No misalignment observed.
Condition at Abutment and at Concrete Structures	Good.
Indications of Movement of Structural Items on Slopes	None.
Trespassing on Slopes	No indications observed.
Sloughing or Erosion of Slopes or Abutments	Erosion scarps on upstream slope extending 1-2 ft above the reservoir level and erosion gullies up to 4-5 ft wide and 2 ft deep.
Rock Slope Protection - Riprap Failures	No riprap on upstream slope.
Unusual Movement or Cracking at or Near Toe	None observed.
Unusual Embankment or Downstream Seepage	None observed.
Piping or Boils	None observed.
Foundation Drainage Features	None observed.
Toe Drains	None observed.
Instrumentation System	None.
Vegetation	Brush and extensive tree growth on slopes.

PERIODIC INSPECTION CHECKLIST

PROJECT WRIGHTS POND DAM DATE Nov. 1, 1979

PROJECT FEATURE Embankment - Dike NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME D. Shields
Structural Engineer R. Cheney
D. Vine

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	No dikes at this project
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or Near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
[illegible]	
[illegible]	

PERIODIC INSPECTION CHECKLIST

PROJECT WRIGHTS POND DAM DATE Nov. 1, 1979

PROJECT FEATURE Outlet Works - Intake Channel And Intake Structure NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME D. Shields

Structural Engineer R. Cheney

D. Vine

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	None observed
a. Approach Channel	
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	No intake structure, spillway is described on Page A-9.
Condition of Concrete	
Stop Logs and Slots	

PERIODIC INSPECTION CHECKLIST

PROJECT WRIGHTS POND DAM

DATE Nov. 1, 1979

PROJECT FEATURE Outlet Works - Control Tower

NAME D. LaGatta

DISCIPLINE Geotechnical Engineer
Structural Engineer

NAME D. Shields
R. Cheney
D. Vine

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	None at this Project
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	None at this Project
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Emergency Power System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECKLIST

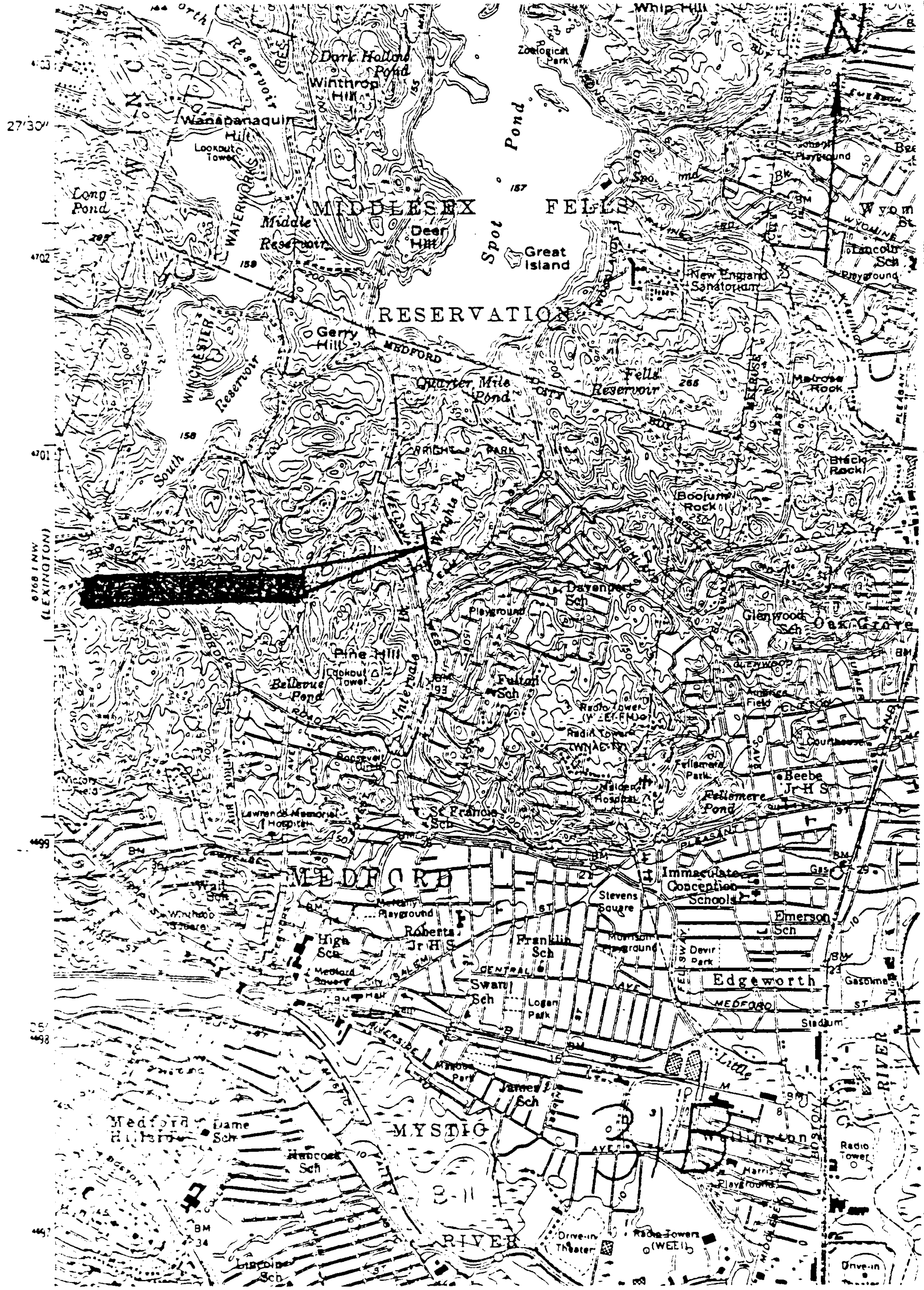
PROJECT WRIGHTS POND DAM DATE Nov. 1, 1979

PROJECT FEATURE Outlet Works - Transition And Conduit NAME D. LaGatta

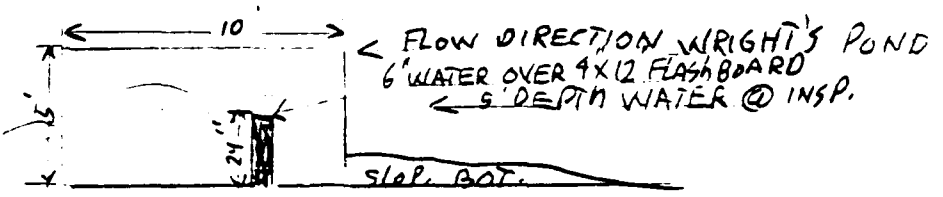
DISCIPLINE Geotechnical Engineer NAME D. Shields

DISCIPLINE Structural Engineer NAME R. Cheney, D. Vine

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	None at this project
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	



27'30"
Whip Hill
Zoological Park
Dark Hollow Pond
Winthrop Hill
Wanapanaquin Hill
Lookout Tower
Long Pond
Spot Pond
MIDDLESEX FELLS
RESERVATION
Middle Reservoir
Deer Hill
Great Island
New England Sanatorium
Lincoln Sch
Playground
Gerry Hill
MEDFORD
Quarter Mile Pond
Fells Reservoir
Melrose Rock
Winchester Reservoir
South
Black Rock
Boojum Rock
Davenport Sch
Playground
Glenwood Sch
Oak Grove
6768 I NW (LEXINGTON)
[redacted]
Pine Hill
Lookout Tower
Bellevue Pond
Fulton Sch
Radio Tower
Radio Tower
Fellsmere Park
Beebe Jr H S
Fellsmere Pond
Malden Hospital
Courthouse
Lawrence Memorial Hospital
St Francis Sch
MEDFORD
Immaculate Conception Schools
Stevens Square
Emerson Sch
Playground
Roberts Jr H S
High Sch
Franklin Sch
Devir Park
Edgeworth
Swan Sch
Logan Park
MEDFORD
Stadium
Little
RIVER
James Sch
MYSTIC
Wellington
Radio Tower
Medford Hillside
Dame Sch
Hancock Sch
Playground
RIVER
Drive-in Theater
Radio Towers (WEEI)
Drive-in
Lincoln Sch



X SECTION AA

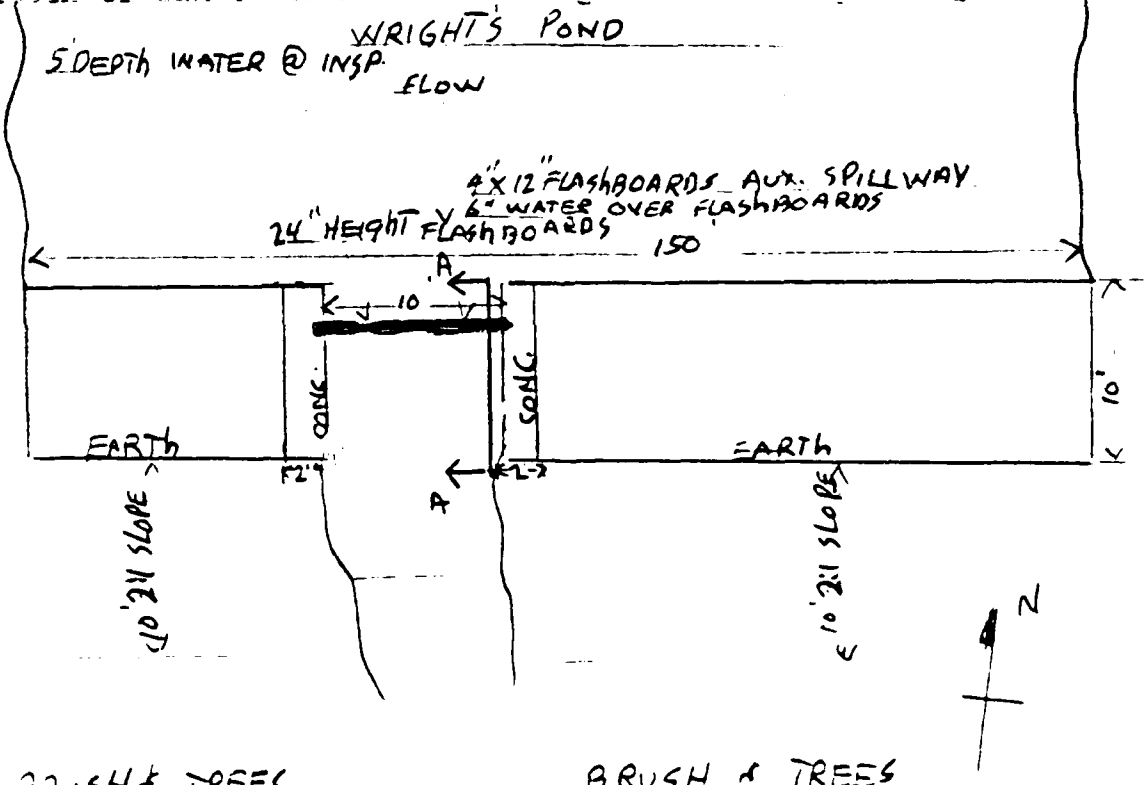
NOT TO SCALE

Dam No. 4-9-176-2

Risk to life and property in event of complete failure.

No. of people	EST 50	
No. of houses	EST 15	
No. of industries	NONE	
No. of farmsteads	1	Type
No. of utilities	1	Type
Bridges	NONE	
Other data	1	
Owner		

Attach sketch of dam to this form showing section and plan 8½" x 11" Sheet.



TOP VIEW

SKETCH NOT TO SCALE

DESCRIPTION OF DAM
DISTRICT #4

Submitted by FRANCIS H. PARÉ & ADAM Z. PIZAN Dam No. 4-9-176-2
Date 3-27-74 City/Town MEDFORD
Name of Dam WRIGHT'S POND DAM

1. Location: Topo Sheet No. 31B
Provide 8 1/2" x 11" in clear copy of topo map with location of Dam clearly indicated.

2. Year built: UNKNOWN Year/s of subsequent repairs UNKNOWN

3. Purpose of Dam: Water Supply ______, Recreational ✓
Irrigation ______, Other ______

4. Drainage Area: 1/2 SQ. MI. 320 ACRES.

5. Normal Ponding Area: 21 acres: Ave. Depth 5'
Impoundment: 35 MIL. gals; 105 acre ft.

6. No. and type of dwellings located adjacent to pond or reservoir
i.e. summer homes etc. NONE

7. Dimensions of Dam: Length 150' Max. Height 5'
Slopes: Upstream Face 3:1
Downstream Face 2:1
Width across top 10'

8. Classification of Dam by Materials:
Earth ✓ Conc. Masonary ✓, Stone Masonary ______
Timber ✓ Rockfill ______, Other ______

9. A. Description of present land usage downstream of dam: 80 % rural;
20 % urban.
B. Is there a storage area or flood plain downstream of dam which could handle the impoundment in the event of a complete dam failure?
yes ✓ no ______

4-9-176-2

(12) Remarks & Recommendations (fully Explain)

DAM IS IN GOOD CONDITION.

(13) Overall Conditions

1. Safe ✓
2. Minor repairs needed
3. Conditionally safe -
4. Unsafe
5. Reservoir impoundment no longer exists

Recommend removal from inspection list

DAM NO. 4-9-176-2

Downstream Face of Dam: Condition: 1. Good ✓ 2. Minor Repairs ____

3. Major Repairs ____ Urgent Repr ____

Comments: _____

Emergency Spillway: Condition: 1. Good ____ 2. Minor Repairs ____

3. Major Repairs ____ 4. Urgent Rep ____

Comments: THERE IS NO EMERGENCY SPILLWAY.

Water Level at time of Inspection 0.5 Ft. above ✓ below ____

top of dam ____ Principal spillway ✓

other ____

III. Summary of Deficiencies Noted:

Growth (Trees and Brush) on Embankment BRUSH ON EMBANKMENT.

Animal Burrows and Washouts ____

Damage to slopes or top of dam ____

Cracked or Damaged Masonry ____

Evidence of Seepage ____

Evidence of Piping ____

Erosion ____

Leaks ____

Trash and/or debris impending flow ____

Clogged or blocked spillway ____

Other ____

OK FILE

INSPECTION REPORT - DAMS AND RESERVOIRS

— MEDFORD — DAM NO. 4-9-176-2

WRIGHTS POND DAM — Inspected By A.Z. PIZAN & F.H. PARE

Date of Inspection 3-27-'74

(2) Owners: ... ✓ ... Prev. Inspection ____

Reg. of Deeds ____ Pers. Contact ____

CITY OF MEDFORD, 85 SALEM ST, MEDFORD, MASS.— 02155 — 396-5500

Name | St. & No. | City/Town | State | Tel.No.

2. ____

Name | St. & No. | City/Town | State | Tel.No.

3. ____

Name | St. & No. | City/Town | State | Tel.No.

(3) Caretaker: (if any, e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

SAME

Name | St. & No. | City/Town | State | Tel.No.

(4) ... Pictures ... NONE

(5) Degree of Hazard: (if dam should fail completely)*

1. Minor ✓ 2. Moderate ____

3. Severe ____ 4. Disastrous ____

*This rating may change as land use changes (future development)

(6) ... Automatic ____ Manual ✓

Operative ✓ Yes: ____ no.

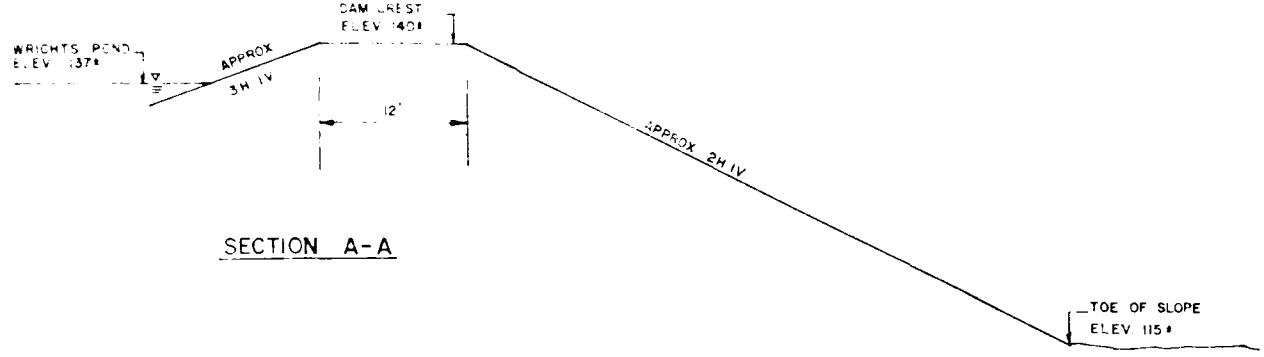
Comments: FLASHBOARDS CONTROL OUTLET FLOW.

(7) ... Condition:

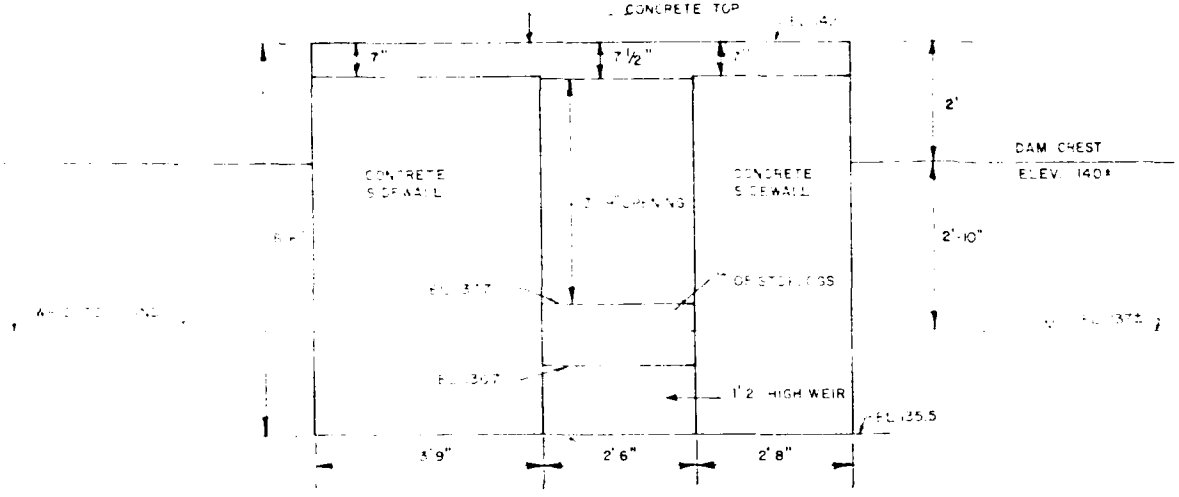
1. Good ✓ 2. Minor Repairs ____

3. Major Repairs ____ 4. Urgent Repairs ____

Comments: ____



SECTION A-A



SPILLWAY UPSTREAM ELEVATION

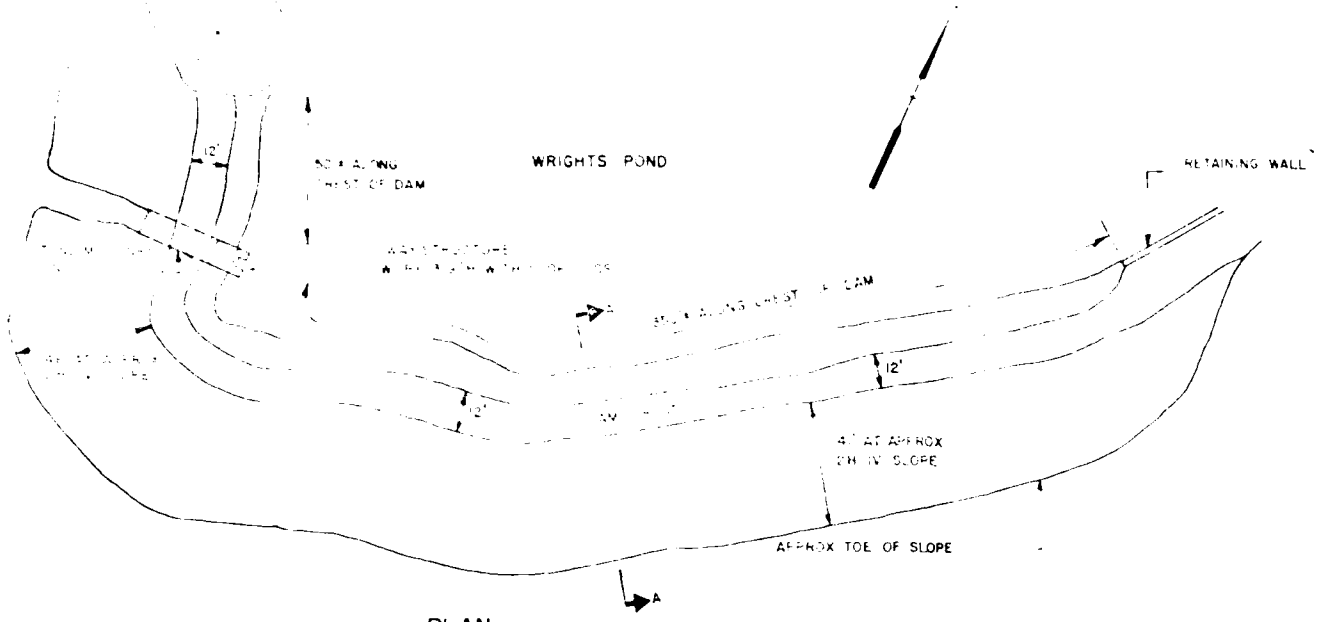
PLAN DEVELOPED FROM ON-SITE INSPECTION

HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

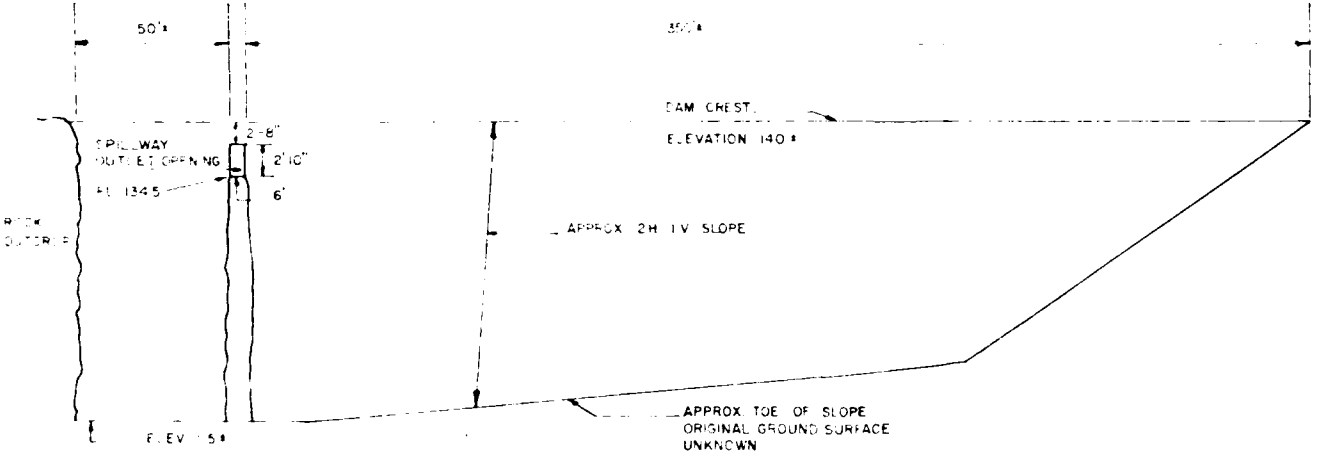
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

WRIGHTS POND DAM
SECTION & SPILLWAY

MILFORD



PLAN



DOWNSTREAM ELEVATION

PLAN DEVELOPED FROM ON SITE INSPECTION

HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WRIGHTS POND DAM
PLAN & ELEVATION

MEDFORD MASSACHUSETTS

			SCALE: NOT TO SCALE
			DATE: MARCH 1980

LIST OF ENGINEERING DATA

A State Inspection Report for March, 1974, is available from the Department of Environmental Quality, Waterways Division, 100 Nashua Street, Boston, Masschusetts.

No additional engineering data was located.

APPENDIX B

ENGINEERING DATA

PERIODIC INSPECTION CHECKLIST

PROJECT WRIGHTS POND DAM DATE Nov. 1, 1979

PROJECT FEATURE Outlet Works - Service Bridge NAME D. LaGatta

DISCIPLINE Geotechnical Engineer NAME D. Shields

Structural Engineer R. Cheney
D. Vine

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	None at this project
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Underside of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

PERIODIC INSPECTION CHECKLIST

PROJECT WRIGHTS POND DAM — DATE Nov. 1, 1979

PROJECT FEATURE Outlet Works - Spillway Weir, Approach and Discharge Channels — NAME D. LaGatta

DISCIPLINE Geotechnical Engineer — NAME D. Shields

Structural Engineer — R. Cheney, D. Vine

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	none observed
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	fair
Rust or Staining	none observed
Spalling	heavy on walls
Any Visible Reinforcing	none observed
Any Seepage or Efflorescence	none observed
Drain Holes	None observed
c. Discharge Channel	
General Condition	not well defined
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	Not significant.
Floor of Channel	Bedrock.
Other Obstructions	Few boulders in the channel near the dam.

PERIODIC INSPECTION CHECKLIST

PROJECT WRIGHTS POND DAM — DATE Nov. 1, 1979

PROJECT FEATURE Outlet Works - Outlet Structure and Outlet Channel — NAME D. LaGatta

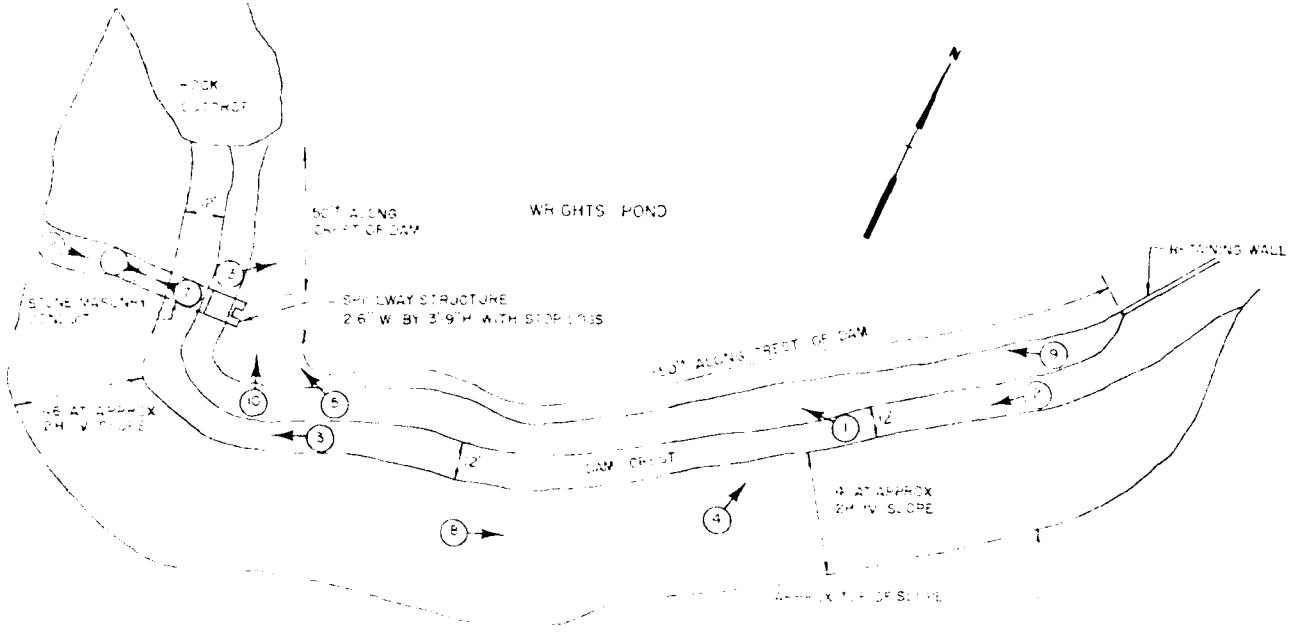
DISCIPLINE Geotechnical Engineer — NAME D. Shields

DISCIPLINE Structural Engineer — NAME R. Cheney, D. Vine

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	None at this project
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	
Channel	
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

APPENDIX C

PHOTOGRAPHS



PLAN

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

WRIGHTS POND DAM

PHOTO LOCATION

PHOTO NO. 1 - Upstream slope of the Dam.

PHOTO NO. 2 - Crest of Dam, viewed from the left abutment.

PHOTO NO. 3 - Trees on downstream slope. Tree near crest in left center of photo appears to be dead.

PHOTO NO. 4 - Tree with 6 foot diameter base growing on the downstream slope approximately 14 feet from the centerline of the crest. The tree appears to be dead. (Rule extended to 6 feet in photo.)

PHOTO NO. 5 - Spillway structure. Note bedrock at the right abutment.

PHOTO NO. 6 - Photo showing the outlet channel downstream of Dam. Discharge flows into a 30 inch corrugated metal pipe set in stone masonry headwall which can be seen in center of photo. A metal debris screen is located in front of the 30 inch pipe. On the day of the field inspection, approximately one foot of this pipe was blocked with stones.

PHOTO NO. 7 - Spillway outlet channel, looking downstream from the spillway.

PHOTO NO. 8 - Downstream slope in the central portion of the Dam, looking left from about midslope.

PHOTO NO. 9 - View of Wrights Pond Dam taken looking right from left abutment. Note trees growing along upstream face of dam. The spillway structure is shown in the right center of the photo. Also note ledge outcrop to right of spillway.

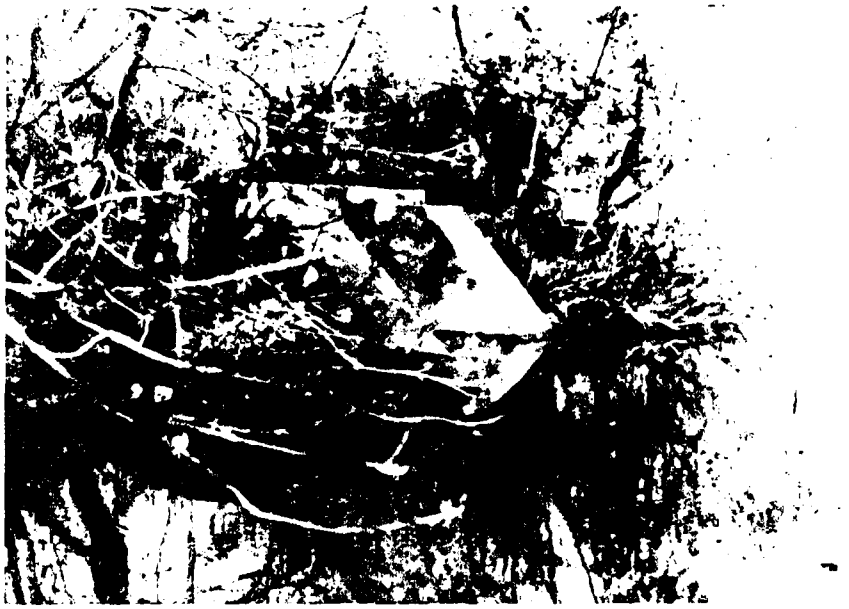
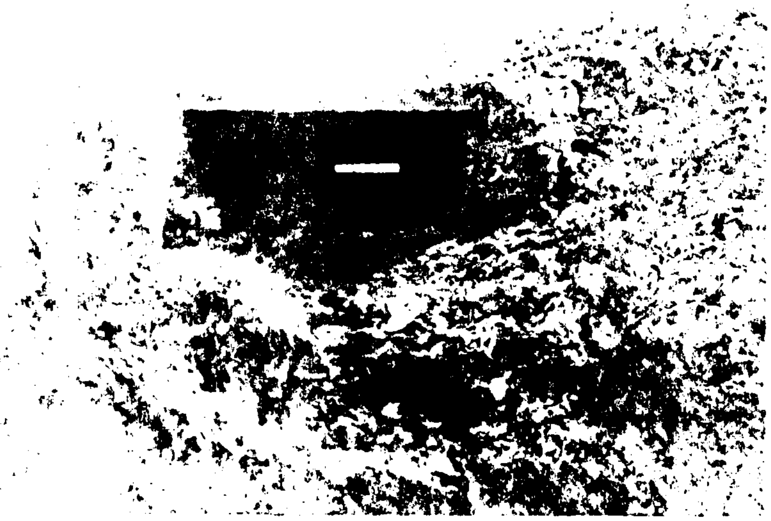


PHOTO NO. 10 - Spillway structure for Wrights Pond. Photo was taken from upstream face of Dam near the clump of trees growing on the Dam shown in the center of Photo 9. Water flows over weir in this structure and into a 6 foot by 2 foot 10 inch rectangular culvert.

[illegible] 1 - Photo taken looking through the outlet [illegible] from the [illegible]wnstream end. Culvert is made [illegible] [illegible]crete lined mortared granite. Note heavy [illegible]ing of concrete lining on wall of structure [illegible] [illegible]umulation of debris in channel. The weir [illegible] about one foot of flashboards in place is [illegible] in the left [illegible]nter of photo.



[illegible] culvert outlet and [illegible] [illegible] the [illegible]wnstream [illegible] [illegible]

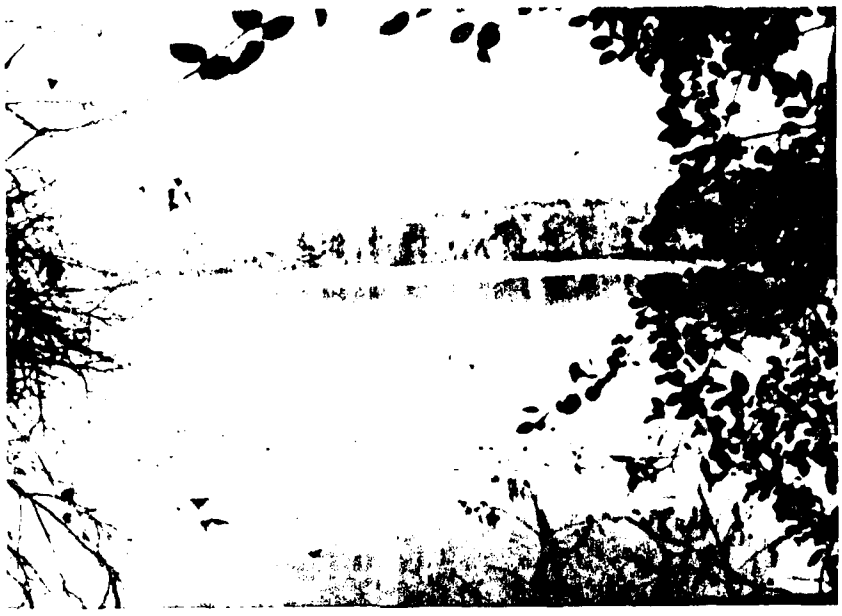


PHOTO NO. 13 - Looking Northward across Wrights Pond from the Dam embankment near the spillway structure.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

Wrights Pond Dam - built in late 1800's

Height of Dam: 25' ± ✓

No emergency spillway. - outlet structure

Earth embankment structure with only one known outlet - concrete weir outlet structure with provisions for stop logs discharges through stone-masonry culvert to small brook downstream.

Storage capacity: $334^{\pm}_{a\text{-}f}$ (to top of dam) ✓

Size Class: Small (by both Height & Storage Capacity)

Drainage Area: 0.41 s.m. (264 acres) ✓

Hazard Potential: High (25 homes)

Test Flood: 1/2 to full PMF : Use full PMF urban area

[3000 csm from Corps Guidelines for small areas 2 s.m. or less]

$Q_{PMF} = 3000 \text{ csm} \times 0.41 \text{ sm} \times 1 = 1{,}230 \text{ cfs}$ ✓ Inflow

$Vd_{PMF} = 19 \text{ in} \times 264 \text{ ac} \times \frac{1 \text{ ft}}{12 \text{ in}} = 418$ ✓ ac-ft (runoff)

With 1' Stop logs @ Outlet El = 141.4 $Q_{out} = 910^{\pm}$ cfs. Outlet Q = 30± cfs or 3.3% Test Flood

Without Stoplogs @ Outlet El = 141.3 $Q_{out} = 830^{\pm}$ cfs Outlet Q = 50± cfs or 6% Test Flood

Failure Outflow: Mid-height breach width = 175' ± of "original channel area".

$$Q_F = \frac{8}{27}(0.4 \times 175)\left(\sqrt{32.2}\right)(25)^{3/2} = 14{,}700 \pm \text{ cfs}$$

Dam fails with pool level at crest of dam (elevation 140±)

Storage Capacity - Elev.'s obtained from USGS Quad Map & field sketchs of structure

Elev. (NGVD)	Area (ac.)	Ave Area. (ac)	D ft	Stor (ac-ft)	Cum Stor (ac-ft)	
✓ 115±	0	—	—	—	—	
130	14.69	7.35	15	110.3	110.3	
✓ 137	23.98	19.29	7	135.0	245.3	Normal pool
✓ 140±	34.89	29.39	3	88.2	333.5	Top Dam (Assumed)
✓ 142	37.64	36.27	2	72.5	406.0	

Outlet Capacity - Test Flood

Dam has only one outlet - discharge controlled by weir with provisions for stop logs. See sketchs in report. Check discharges for weir with & without stoplogs.

Broad crested weir $Q = CLH^{3/2}$

No Stop Logs [See Page 5] 1' Stop Logs

H ft	$H^{3/2}$	C	L ft	Q cfs
1	1	2.98	2.5	7.5
2	2.83	3.30	"	23.3
3	5.20	3.32	"	43.2 ✓
3.3	5.99	"	"	49.7

H ft	$H^{3/2}$	C	L ft	Q cfs
1	1	2.98	2.5	7.5
2	2.83	3.30	"	23.3 ✓
2.3	3.49	3.31	"	28.9

Max. capacity of outlet = 50 ± cfs without overtopping dam
PMF inflow = 1230 cfs.
∴ Dam overtopped with or without stoplogs in place.

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

say PMF overflows top of dam for 200±'

again weir Flow: $Q = CLH^{3/2}$

H ft	$H^{3/2}$	C	L ft	Q cfs.
1	1	2.63	200	526
2	2.63	"	"	1489 ✓
1.75	2.32	"	"	1218
1.70				1165

A) Q_{P_1} = 1230 cfs.± $Elev_1$ = 147.7± ✓ No Stop logs.

El_0 = 136.7± $Stor_1$ = 395.1 − 245.3 = 149.8 ac-ft ✓ or 6.81"
$Stor_0$ = 245.3 a-f

$Q_{P_2} = 1230\left(1 - \frac{6.81}{19}\right)$ = 789 ✓ cfs. $Elev_2$ = 141.25'± ✓

$Stor_2$ = 380.6 − 245.3 = 135.3 ac-ft or 6.15"

$Q_{P_3} = 1230\left(1 - \frac{6.15}{19}\right)$ = 831 ✓ cfs. $Elev_3$ = 141.30±

B) Q_{P_1} = 1230 cfs ± $Elev_1$ = 141.8 1' Stop logs

El_0 = 137.7± $Stor_1$ = 397 − 275 = 122 ac-ft or 5.55"
$Stor_0$ = 275 a-f

Q_{P_2} = 1230 (1 − 5.55/19) = 871 cfs. $Elev_2$ = 141.37'±

$Stor_2$ = 384 − 275 = 109 or 4.95"

$Q_{P_3} = 1230\left(1 - \frac{4.95}{19}\right)$ = 909 ✓ cfs. $Elev_2$ = 141.41'±

79.206.1
12/19/79
FDD

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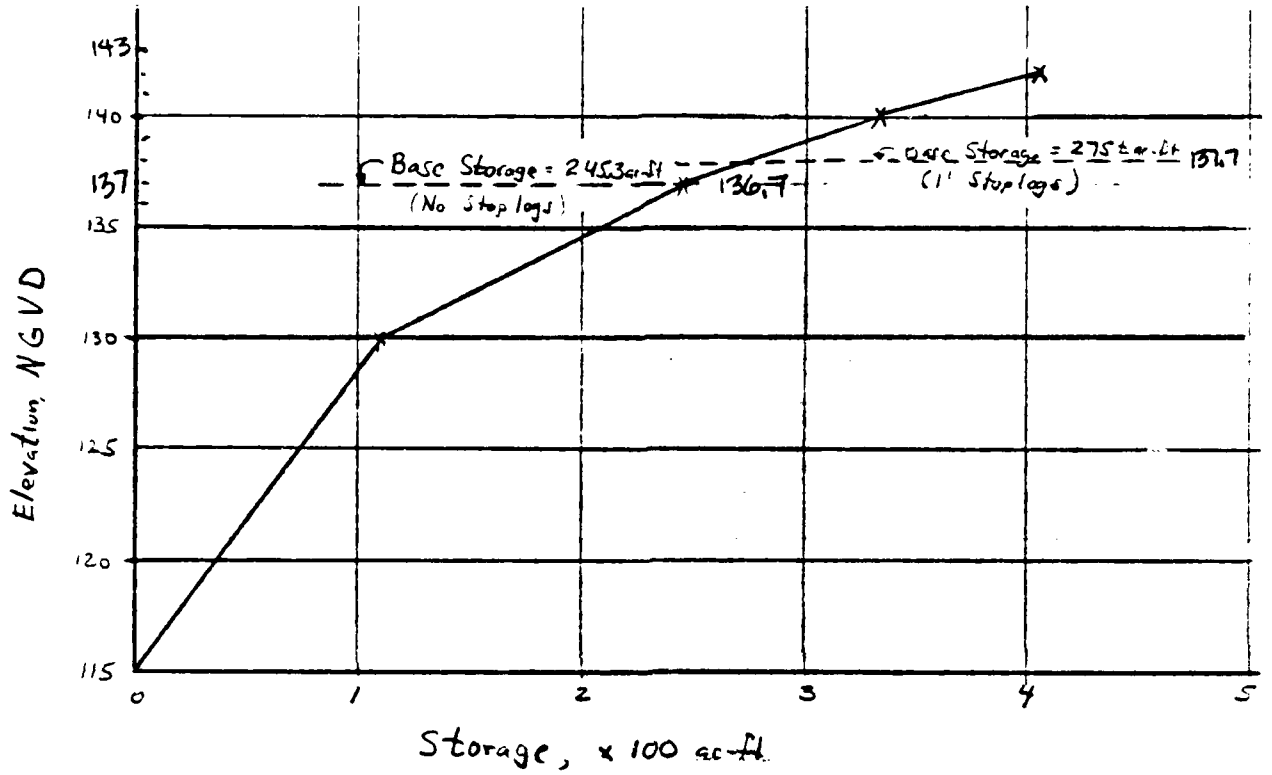
BOSTON — WEST HARTFORD

SHEET NO D 5
JOB Dams
SUBJECT Wrights Pond Dam
CLIENT Corps



Summarizing Test Flood: Full PMF

For No Stop Logs. Dam overtopped by 1.3' ±

Q_{out} = 831 cfs ±

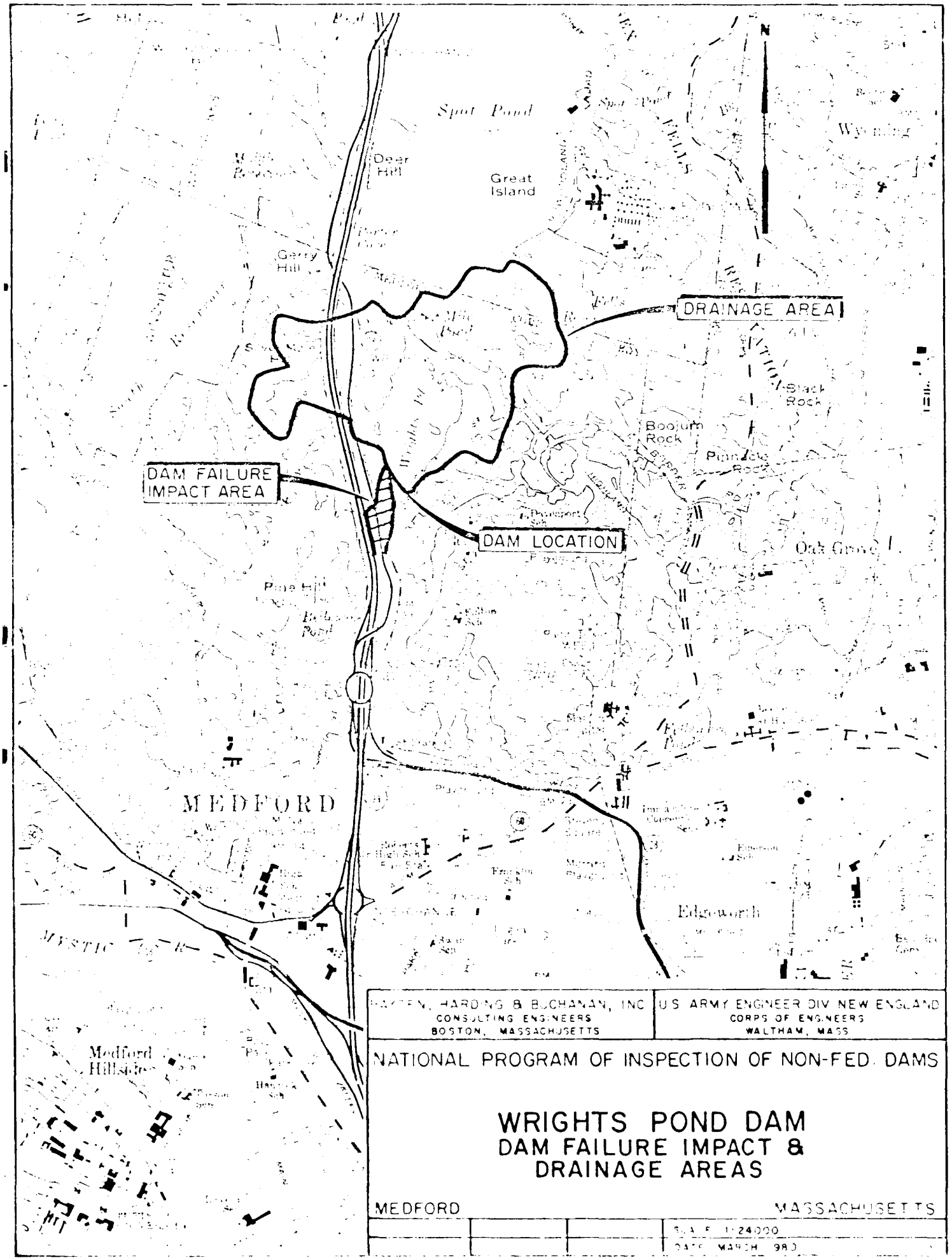
For 1' Stop Logs: Dam overtopped by 1.4' ±

Q_{out} = 909 cfs ±

With No stop logs, Spillway can pass 50 ± cfs or approximately 4% of Test Flood of 1230 cfs.

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS



HAYDEN, HARDING & BUCHANAN, INC CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WRIGHTS POND DAM
DAM FAILURE IMPACT & DRAINAGE AREAS

MEDFORD MASSACHUSETTS

			SCALE 1:24000
			DATE MARCH 980

JOB NO. 79206.1
DATE 12/18/79
BY FDD
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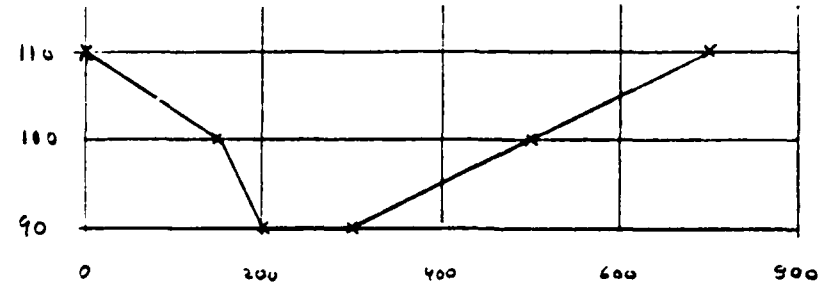
SHEET NO D15
JOB Dams
SUBJECT Wrights Pond Dam
CLIENT Corps

Sections - taken looking upstream

Sta. 7+50



Elev.	Area sf
100	2250
110	7500

$S = \frac{10}{800} = 0.0125'$, $n = 0.10$ (heavy residential development)

B NO. 79.206.1
TE 12/14/79
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D BY WR

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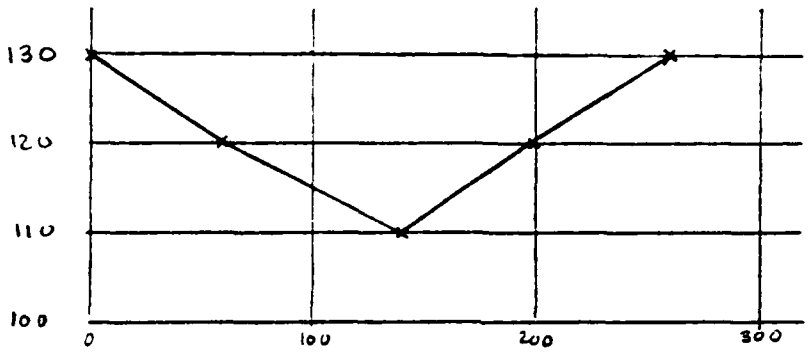
SHEET NO D14
JOB Dams
SUBJECT Wrights Pond Dam
CLIENT Corps

Failure of Wrights Pond Dam

Sections taken looking upstream

Sta. 0+50 downstream

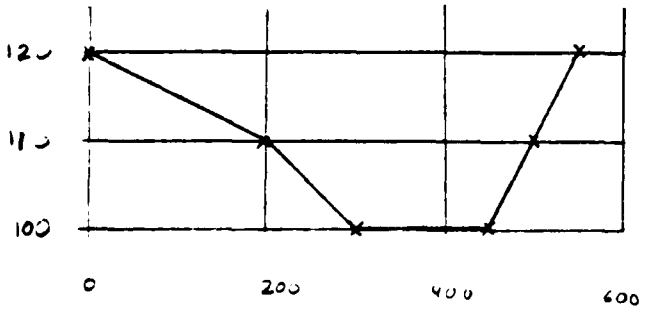


Elev. ft	Area sf
120	875
130	3000

slope = $\frac{30}{200}$ = 0.15% n = 0.100 (medium trees, med-hvy. brush)

Sta 3+00 downstream (Road crossing)

(assume any culverts blocked.)



Elev. ft	Area sf
110	2250
120	6500

slope = $\frac{10}{600}$ = 0.0125 n = 0.10 (Lawns, house, shrubs, trees, streets)

$Q_{P_1} = 14,265$ cfs $\quad d_1 = 10.4'$

$Vol_1 = \frac{2393+2235}{2} \times \frac{450}{43560} = 23.9$ ac-ft

$Q_{P_2} = 14,265\left(1 - \frac{23.9}{3335}\right) = 13,243$ cfs. $\quad d_2 = 10.1'$

$Vol_2 = \frac{2265+2235}{2} \times \frac{450}{43560} = 23.3$ ac-ft

$Vol_{ave} = \frac{23.9+23.3}{2} = 23.6$ ac-ft

$Q_{P_2} = 14265\left(1 - \frac{23.6}{333.5}\right) = 13,256$ cfs. $\quad d_2 = 10.1' \pm$

$Q_{out} = 13,256$ cfs $\quad Elev = 100' \pm$

Impact Area: Although the impact area for the failure of this dam is not extensive, it does include heavily built up areas (i.e. those denoted by "red tint" on the U.S.G.S. Quad Sheet). With the calculated velocities (6 fps or better) and depths (up to 10 feet in places), excessive damages to homes, structures, and roadways could be expected from the outflow of Wrights Pond due to failure of the dam. The loss of possibly several lives could occur as a result of this event.

Sta 0+00 to 7+50 ±

Within this impact area there are at least 25 residential buildings. Damage beyond this location will occur.

$Q_{p_1} = 14,656$ cfs. $d_1 \approx 10.0' \pm$

$Vol_1 = \frac{865 + 2250}{2} \times \frac{250}{43,560} = 6.94$ ac-ft ✓

Average End Area

$Q_{p_2} = 14,656 \left(1 - \frac{6.94}{333.5}\right) = 14263$ cfs. ✓ $d_2 = 9.9'$

$Vol_2 = \frac{865 + 2220}{2} \times \frac{250}{43,560} = 8.85$ ac-ft.

$Vol_{ave} = \frac{6.94 + 8.85}{2} = 8.90$ ac-ft

$Q_{p_3} = 14,656 \left(1 - \frac{8.90}{333.5}\right) = 14,265$ ✓ $d_2 = 9.9'$

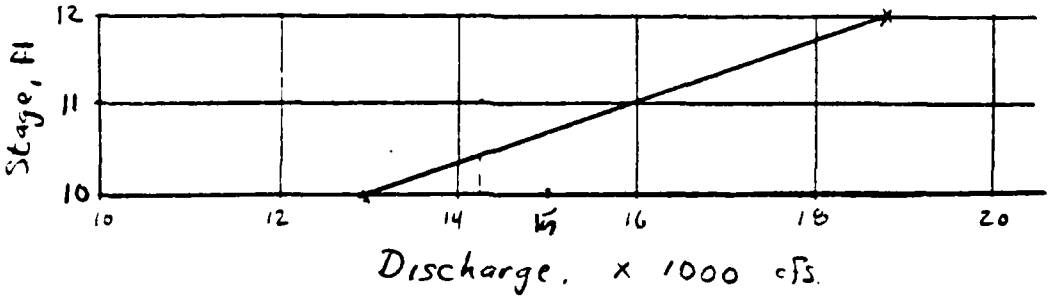
$Q_{out} = 14,265.$ Elev. $= 110.1' \pm$

Sta 7+50

$s = 0.0125$ $n = 0.10$

$V = f' R^{2/3}$ $V = 1.66 R^{2/3}$ ✓

D ft	wp ft	A sf	$R^{2/3}$	f'	V fps	Q cfs	Elev. MSL
10	350	2250	3.48	1.66	5.77	12994	100
12	420	3020	3.75 ✓	"	6.22 ✓	18799 ✓	102



Q_{P_1} = 14,700 cfs $d_1 \cong 10.0'$ ✓

found area in s.f.-

$Vol_1 = 875 \times \frac{50}{43560} = 1.00$ ac-ft

$Q_{P_2} = 14,700\left(1 - \frac{1}{335.5}\right) = 14,655$ cfs. ✓ $d_2 = 9.9'$

$Vol_2 = 858 \times \frac{50}{43,560} = 0.98$ ac-ft $Vol_{ave} = 0.99$ ac-ft

$Q_{P_2} = 14,700\left(1 - \frac{.99}{333.5}\right) = 14,656$ cfs. $d_2 = 10.1'\pm$

$Q_{out} = 14,656$ ✓ cfs. Elev = $120.1' \pm$

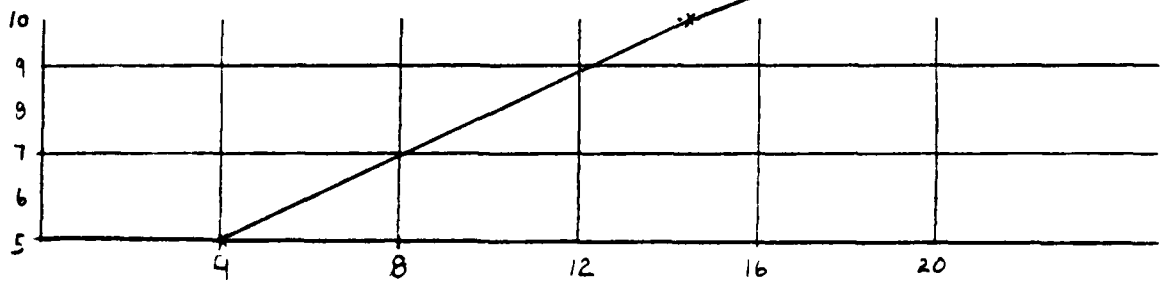
Sta 3+00

slope = 0.0125 ft/ft n = 0.10

$V = f' R^{2/3}$ $f' = \frac{1.486}{0.10}(.0125)^{1/2} = 1.66$ ✓

$V = 1.66\, R^{2/3}$

D ft	wP ft	A sf	$R^{2/3}$	f'	V fps	Q cfs	Elev MSL
10	300	2250	3.86	1.66	6.43	14,469	110
11	325	2563	3.99	"	6.62	16,971	111
5	225	938	2.60	"	4.32	4,048	105



Failure Discharge

Q_f = 14,700 cfs.

Base flow = 30-50 ± cfs @ time of failure — not significant compared to failure discharge, so will not include in routing.

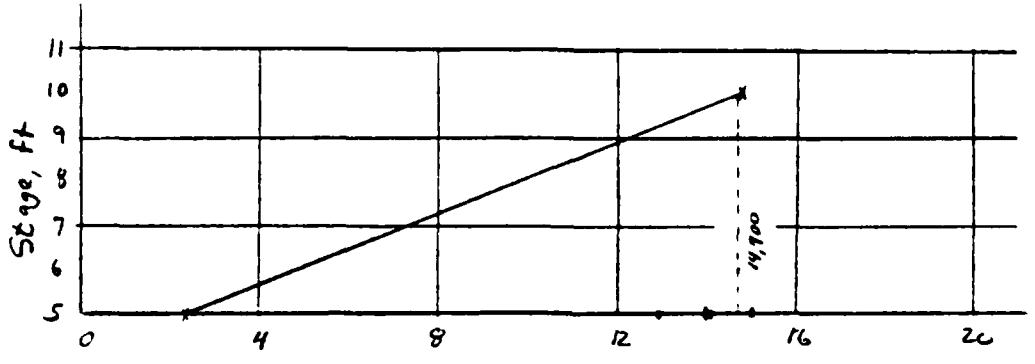
Sta. 0+50

slope = 0.15% n = 0.10

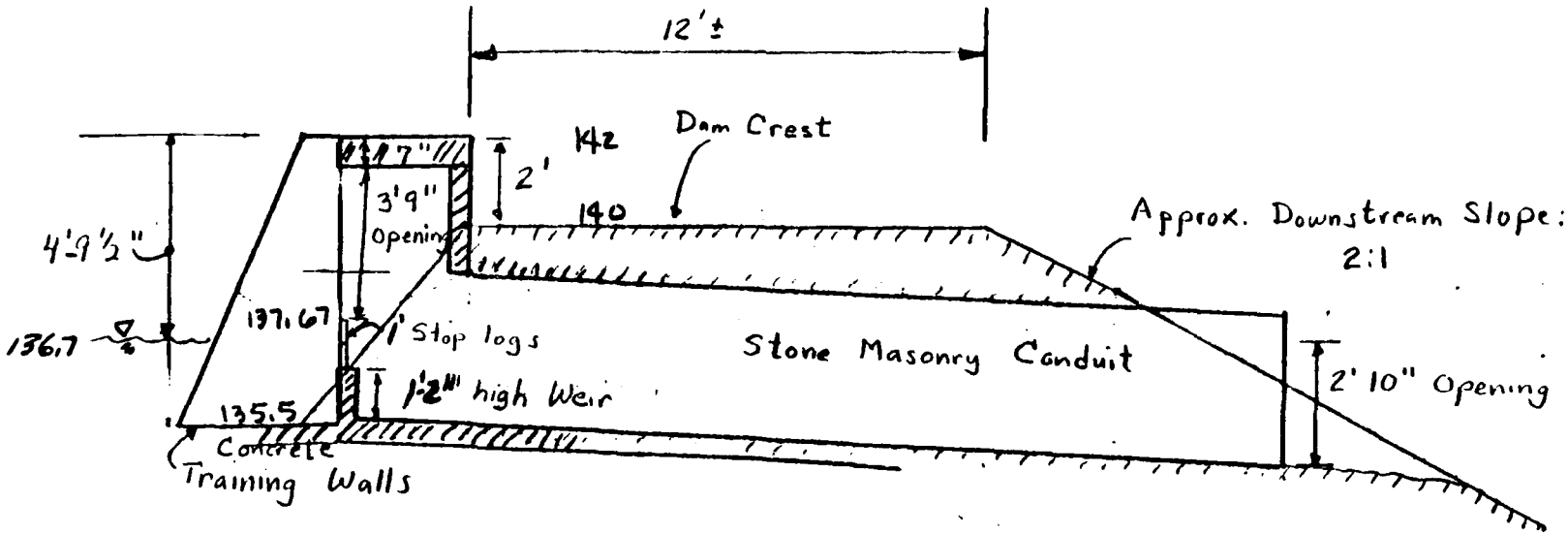
$V = f' R^{2/3}$ $f' = \frac{1.486}{0.10}(0.15)^{1/2} = 5.76$ ✓

$V = 5.76\, R^{2/3}$

D	WP	A	$R^{2/3}$	P'	V	Q	Elev.
ft	ft	sf			fps	cfs	MSL
10	175	875	2.94 ✓	5.76	16.93 ✓	14816 ✓	120
5	975	219	1.85	"	10.64	2331	115

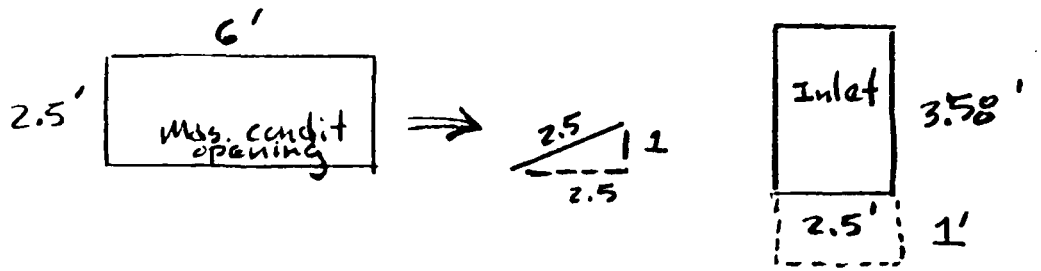


Q_{p_1} = 14,700 cfs $d_1 \cong 10.0'$



Section View

Approx. Scale: Hor. & Vert. 1" = 4'



JOB NO. 76.206.1
DATE 12/16/79
BY FDD
CH'D BY MR

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BOSTON — WEST HARTFORD

JOB Dams
SUBJECT Wright Pond Dam
CLIENT Cheshire

SHEET NO. D9

JOB NO. 79.206.1
DATE 12/14/79
BY FDD
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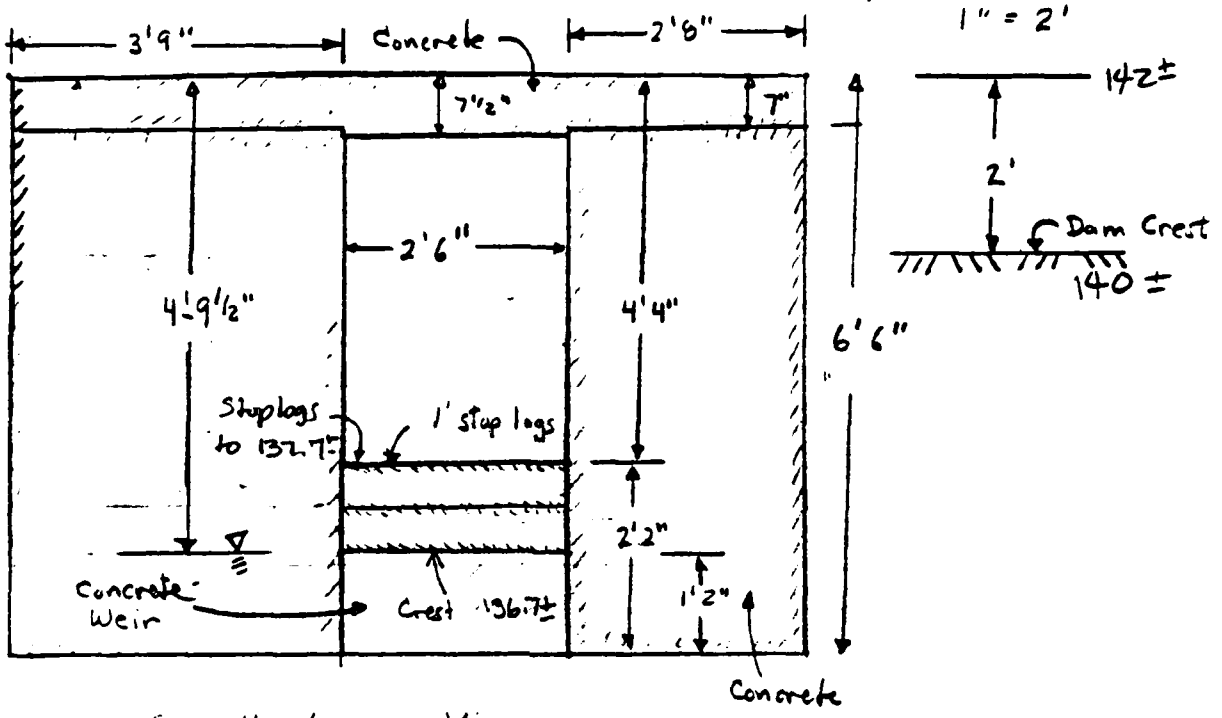
BOSTON — WEST HARTFORD

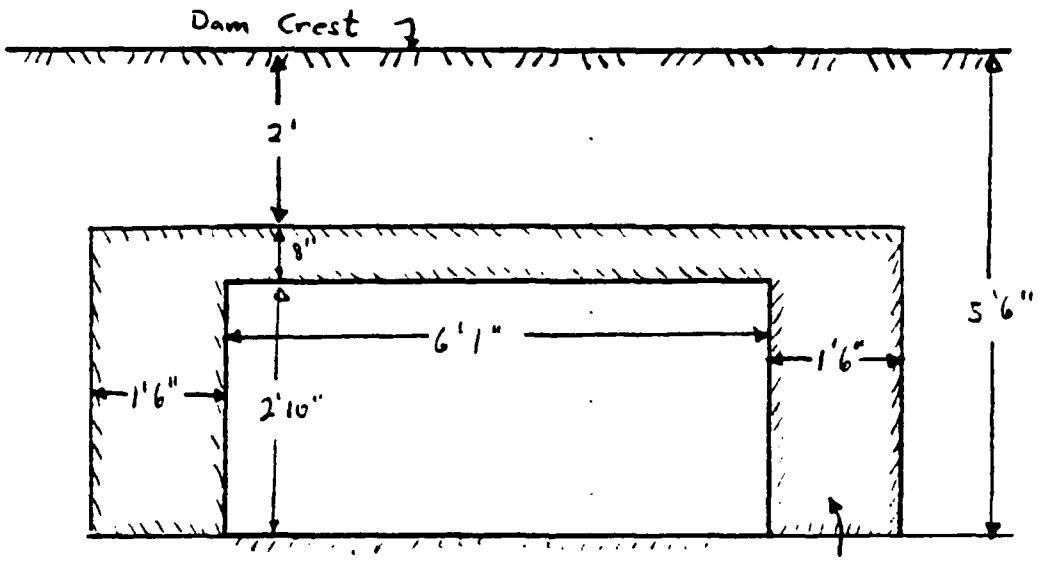
SHEET NO D 8
JOB Dams
SUBJECT Wright Pond Dam
CLIENT Corps

Outlet Structure - Elevation

Approx. Scale: Hor & Vert 1" = 2'



Upstream View



Downstream View

Concrete Lined Masonry

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DATE 4-22-80
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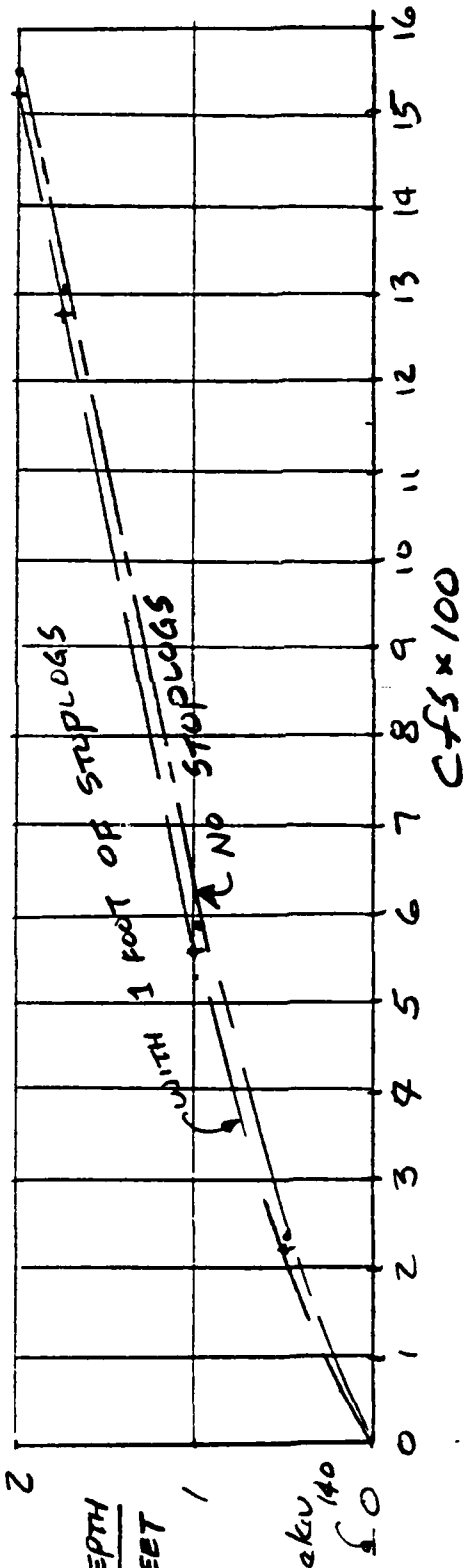
SHEET NO. D7A
JOB Dams
SUBJECT Wrights
CLIENT ccE



Combined Discharge Capacity
Outlet Structure & Over-flow

B NO. 79.206.1
TE 4-22-80
MH
D BY

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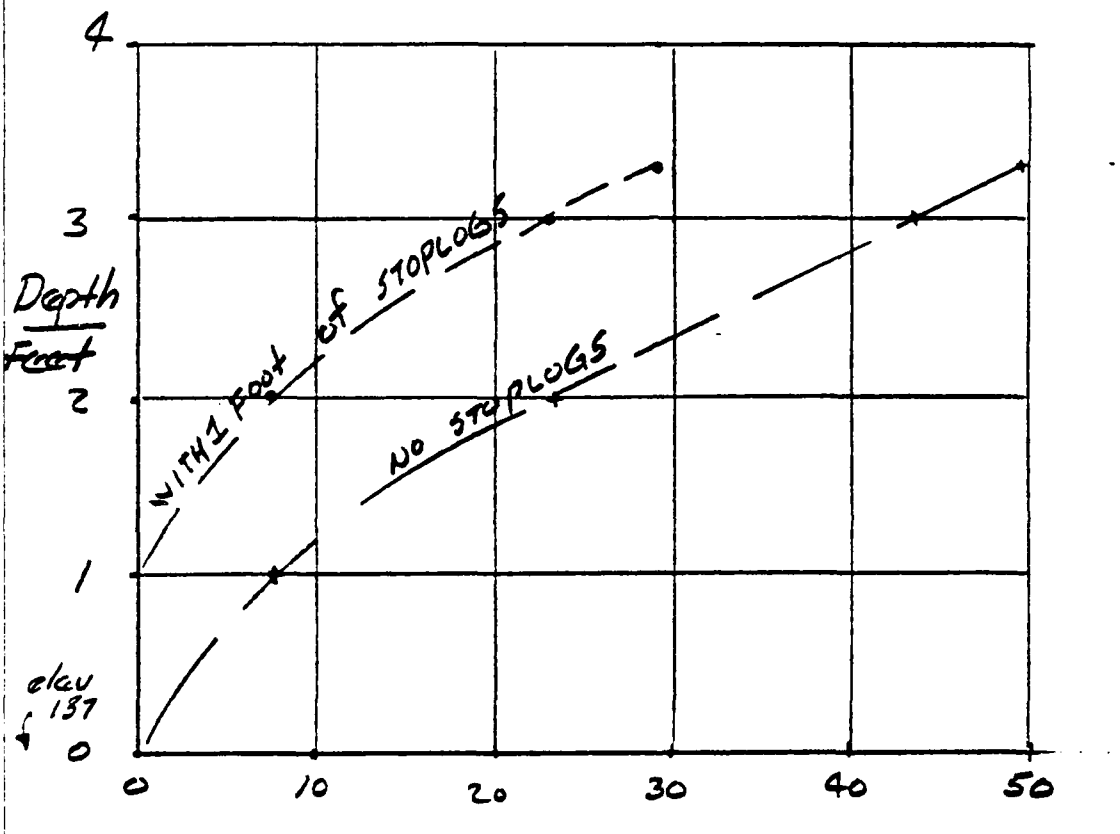
SHEET NO. 27
JOB Dams
SUBJECT Wellsboro
CLIENT COE



Outlet Discharge Capacity

cfs

Check Storage Routing for 1/2 PMF:

c) $Q_{P_1} = 615$ cfs ± Elev = 141.03± No Stoplogs

$Stor_1 = 335.7 - 245.3 = 90.4$ ac-ft or 4.11 in

$Q_{P_2} = 615\left(1 - \frac{4.11}{9.5}\right) = 349$ cfs $Elev_2 = 140.7\pm$

$Stor_2 = 334.0 - 245.3 = 88.7$ ac-ft or 4.03 in

$Stor_{ave} = \frac{4.11 + 4.03}{2} = 4.07$ in

$Q_{P_3} = 615\left(1 - \frac{4.07}{9.5}\right) = 352$ cfs $Elev_3 = 140.7\pm'$

D) $Q_{P_1} = 615$ cfs Elev. = 141.07± 1' Stoplogs

$Stor_1 = 338.5 - 245.3 = 93.5$ ac-ft or 4.23 in

$Q_{P_2} = 615\left(1 - \frac{4.23}{9.5}\right) = 341$ cfs. $Elev._2 = 140.6\pm$

$Stor_2 = 334.0 - 245.3 = 88.7$ ac-ft or 4.03 in

$Stor_{ave} = 4.13$ in

$Q_{P_3} = 615\left(1 - \frac{4.13}{9.5}\right) = 348$ cfs $Elev_3 = 140.6\pm'$

Summarizing for 1/2 PMF:

For either spillway condition (No stoplogs or 1' stoplogs)

Dam overtopped by 0.7' ±

$Q_{out} = 350$ cfs ±

For No Stoplogs Spillway Q = 50 cfs ± or 14% 1/2 PMF Outflow
" 1' " " Q = 30 cfs ± or 8.6% " " "

END

FILMED

7-85

DTIC